

REMARKS

Request for Reconsideration

Applicant has carefully considered the matters raised by the Examiner in the outstanding Office Action but remains of the position that patentable subject matter is present. Applicant respectfully requests reconsideration of the Examiner's position based on the above amendments to the claims and the following remarks.

Claims Status

Claims 1 and 3-9 are pending in this Application.

Claims 1 and 7 have been amended herein to add the limitations of Claim 2 and Claim 2 has been canceled.

Claims 8 and 9 have been added to recite that the maximum amount of ink jetted is determined based on the droplet size. Support for this limitation can be found on page 13, lines 11-14.

Rejection

Claims 1-4, 6 and 8 had been rejected as being unpatentable over a combination of Mills and Moriyama while Claim 5 had been rejected as being unpatentable over a combination of Mills, Moriyama and Hintermann.

The Examiner had taken the position that Mills teaches an image recording device where ink is jetted and irradiated to cure the ink. The Examiner has taken the position that Moriyama teaches that the amount of ink is decreased with increased recording speed and that the amount of ink is increased with decreased recording speed, cited to Column 16, lines 26-56. Applicant respectfully submits that the Examiner has misread Moriyama at Column 16, lines 26-56.

Moriyama teaches that, for a fast recording mode (360 dpi), he discharges 50 ng of ink per dot. On the other hand, for a slow recording speed (720 dpi), he discharges 30 ng of ink per drop, see Column 16, lines 26-33. Thus, Moriyama is teaching that more ink is jetted at higher recording speed and less ink is jetted at slower recording speeds. This is opposite the present Invention. In the present Invention, at the higher recording speeds, the

amount of ink that is discharged is decreased while, at slower speeds, the amount of ink that is jetted is increased. The difference in the two processes is related to the fact that the present Invention is directed to ultraviolet curable ink while Moriyama is directed to conventional inks.

The present Invention uses ultraviolet curable inks which are cured by radiation. In such inks, if the amount of irradiation applied to the wet ink is insufficient, then the curing of the ink is also insufficient. Additionally, when the amount of irradiation applied per unit of ink varies, there can be inconsistencies in the curing and this can result in deterioration in the image quality due to the deterioration in the adhesiveness of the ink to the substrate as well as wrinkles can occur on the surface of the ink itself. This means that, for ray curable inks, the amount of irradiation must be sufficient and consistent.

It is important to have sufficient and consistent irradiation of the ink without having any complicated exposure control system. It is cumbersome to closely control the amount of radiation that is applied to the ink.

The present Invention solves these problems by providing a plurality of recording modes wherein the maximum amount of ink jetted is decreased for fast image recording speed and the maximum amount of ink jetted is increased for slow image recording speed. Claims 1 and 7 have been amended herein to specifically point out this particular aspect of the present Invention. It is submitted that this particular aspect of the present Invention is neither taught nor suggested in the Prior Art.

Mills does not teach that his device has a plurality of recording modes with different recording speeds nor does he recite that he is able to change the maximum amount of ink to be jetted according to the recording modes. Mills does not teach decreasing the amount of ink jetted at a high recording speed nor does he teach increasing the amount of ink jetted at a low recording speed.

Moriyama does teach an apparatus having a plurality of recording modes, however, Moriyama does teach changing the amount of ink to be jetted according to the resolution of the image. In other words, Moriyama is teaching that the amount of ink jetted is a function of resolution, not recording speed. Where resolution is high (720 dpi), the

amount of ink that is jetted is small while, at low resolution (360 dpi), the amount of ink to be jetted is high. Thus, Moriyama and the present Invention are directed to totally different concepts.

The present Invention controls the amount of ink to be jetted based on the speed of the recording, not the resolution. In fact, this aspect of the present Invention can be seen by referring to the examples and the Examiner's attention is directed specifically to Figure 5. For Examples 1 through 5, it can be seen that the resolution (dpi) is maintained constant, however, the amount of ink that is jetted is varied. For example, the Examiner can compare Recording Conditions 2 and 3 where resolution is the same, the number of passes is the same, the amount of ink droplet per pixel is the same, however, the amount of ink that is applied is different. For Recording Condition 2, the amount of ink applied per m^2 is 35.4 while, in Recording Condition 3, the amount of ink applied is 22.1. It can be seen that, by decreasing the amount of ink applied, better results are obtained. Thus, in the present Invention, it is desirable to control the amount of ink that is applied to the substrate relative to the speed at which the ink is applied to the substrate.

In the present Invention, ink is applied to substrates that do not absorb the ink. This is because the ink is fixed on a recording medium by irradiation.

At relatively high recording speeds, the amount of time that the ink is irradiated is relatively short. Therefore, at high recording speeds, the maximum amount of ink to be jetted onto the substrate is controlled so as to decrease the amount of ink and, thereby, allow for a sufficient amount of time for fixing the ink onto the substrate. On the other hand, when the recording speed is slow, the amount time that the ink can be irradiated is increased, which allows for more ink to be applied to the substrate and makes it possible for more ink to be cured.

By controlling the maximum amount of ink to be jetted, based on the recording speed, sufficient curing can occur and the amount of irradiation per unit area can be kept constant.

Respectfully, the combination of Moriyama and Mills does not result in a device where the amount of ink is decreased with increased recording speed and the amount of ink is increased with decreased recording speed.

With respect to newly added Claims 8 and 9, it will be noted that the ink droplet size is determined based on the amount of ink jetted, thus the ink droplet size is decreased for increased recording speed and the size of the droplet is increased for decreased recording speed.

Hintermann does not add the limitations that are missing from Moriyama and Mills, namely, that the amount of ink is increased for decreased recording speed and the amount of ink is decreased for increased recording speed.

Thus, it is respectfully submitted that the claims, as presented herein, are patentable over Mills, Moriyama or Hintermann taken alone or in combination.

Conclusion

In view of the foregoing, it is respectfully submitted that the Application is in condition for allowance and such action is respectfully requested.

Should any fees or extensions of time be necessary in order to maintain this Application in pending condition, appropriate requests are hereby made and authorization is given to debit Account # 02-2275.

Respectfully submitted,

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